



# Modeling climate change impacts on forest productivity with PnET-CN

Emily Peters, Kirk Wythers, Peter Reich

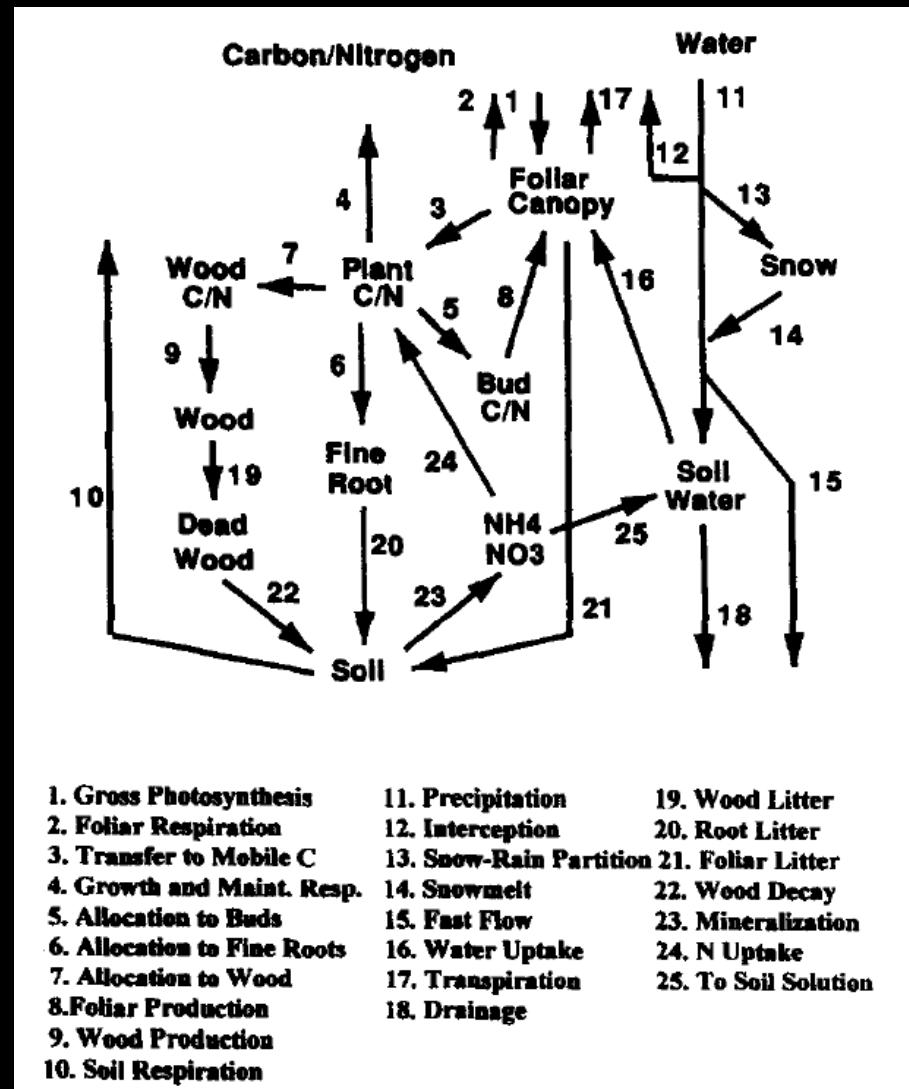
NE Landscape Plan Update

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# PnET-CN Model Overview



- Simulates carbon, water, and nitrogen cycling in forests
- “Big-leaf” model
- Stand/ ecosystem scale
- Represents forest types
- Monthly time step

# Model Inputs

## Climate variables

- air temperature
- precipitation
- solar radiation
- CO<sub>2</sub> concentration
- N deposition rates
- O<sub>3</sub> concentration (D40)

## Site parameters

- soil water holding capacity
- land use history

## Vegetation parameters (n=46)

- canopy traits (leaf lifespan, thickness)
- photosynthesis & respiration
- water balance
- carbon allocation
- biomass turnover
- N concentration

# Model Outputs

## C cycling

- Net primary production (wood, leaves, roots)
- Net ecosystem production
- C storage (wood, leaves, roots)

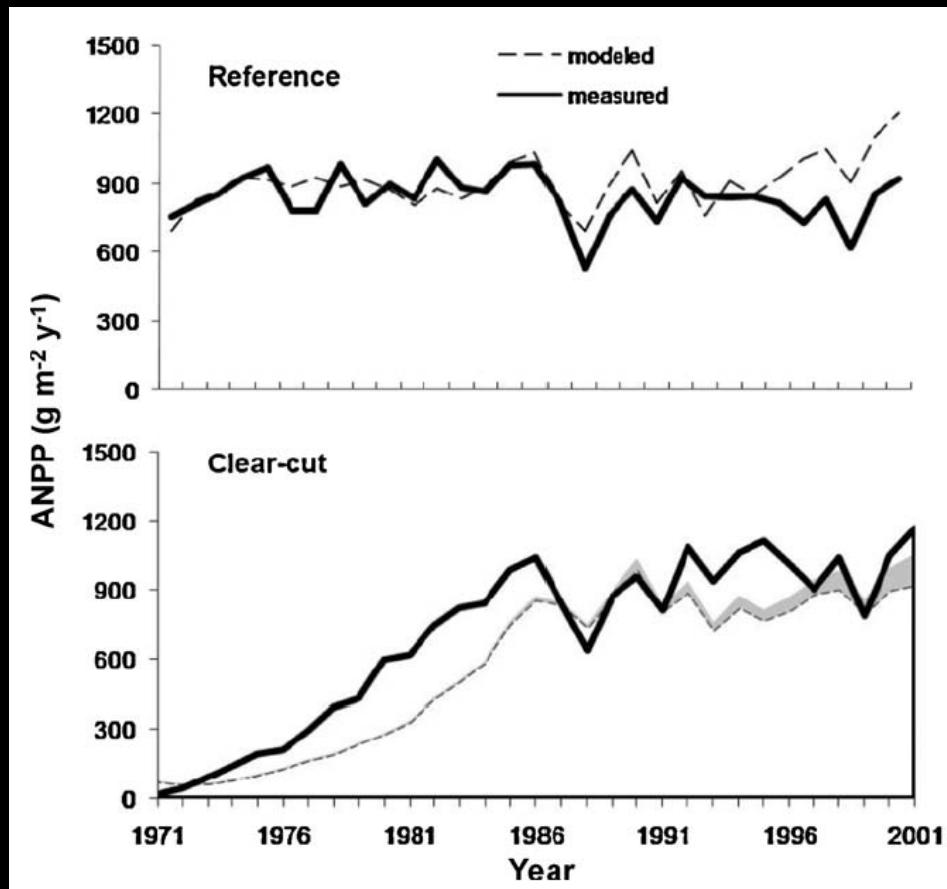
## N cycling

- Net N mineralization
- Net nitrification
- Foliar N concentration

## H<sub>2</sub>O cycling

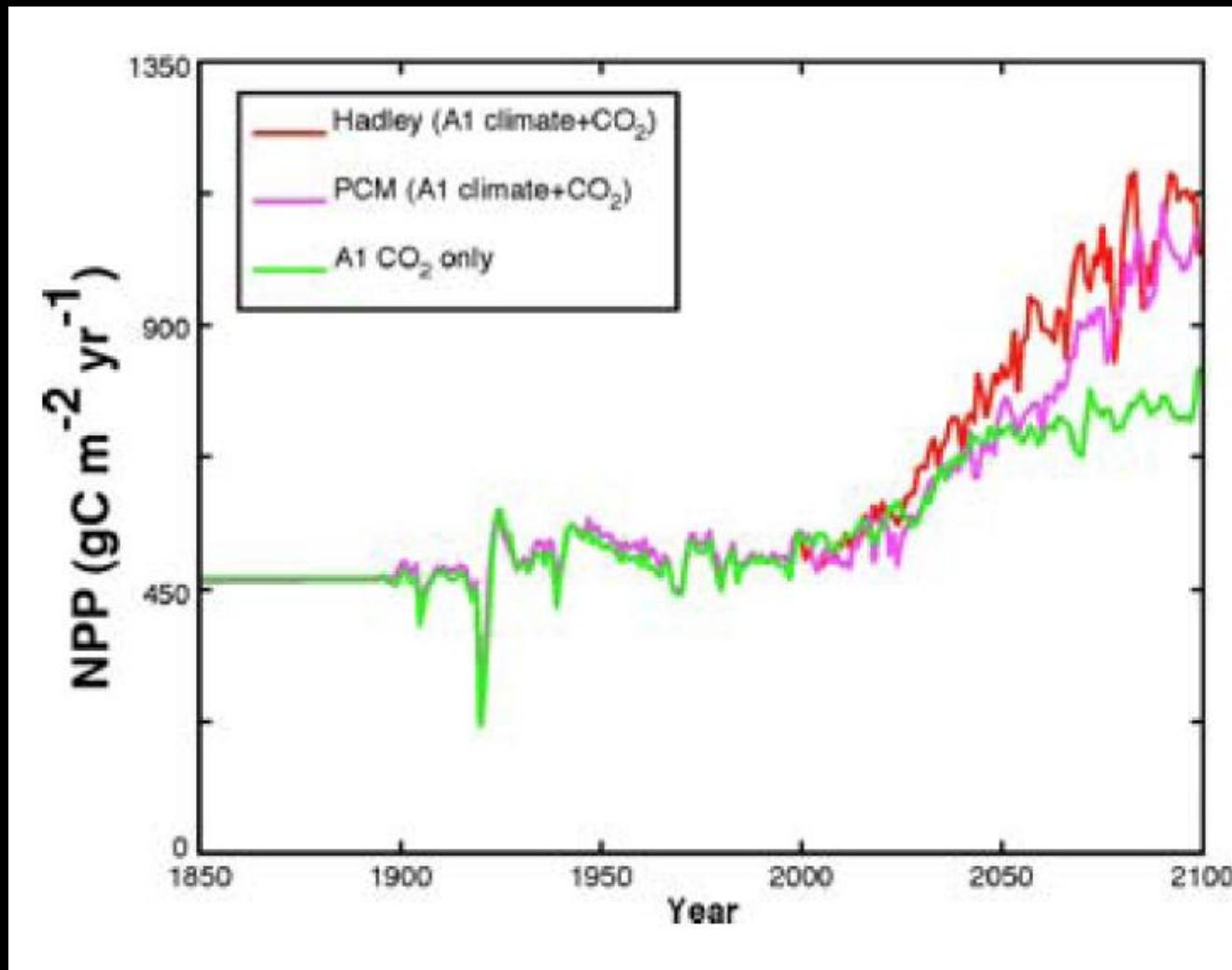
- Evapotranspiration

Ex: hardwood forest in West Virginia



# Climate Change Application

Ex: hardwood forest in New Hampshire

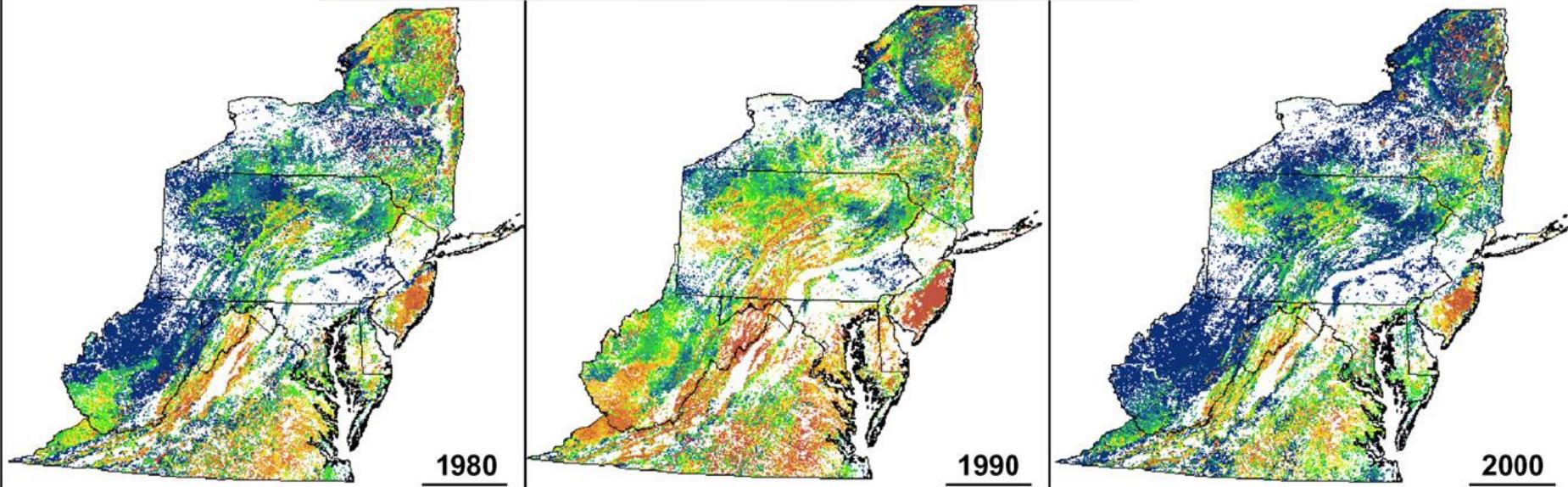


# Regional Application

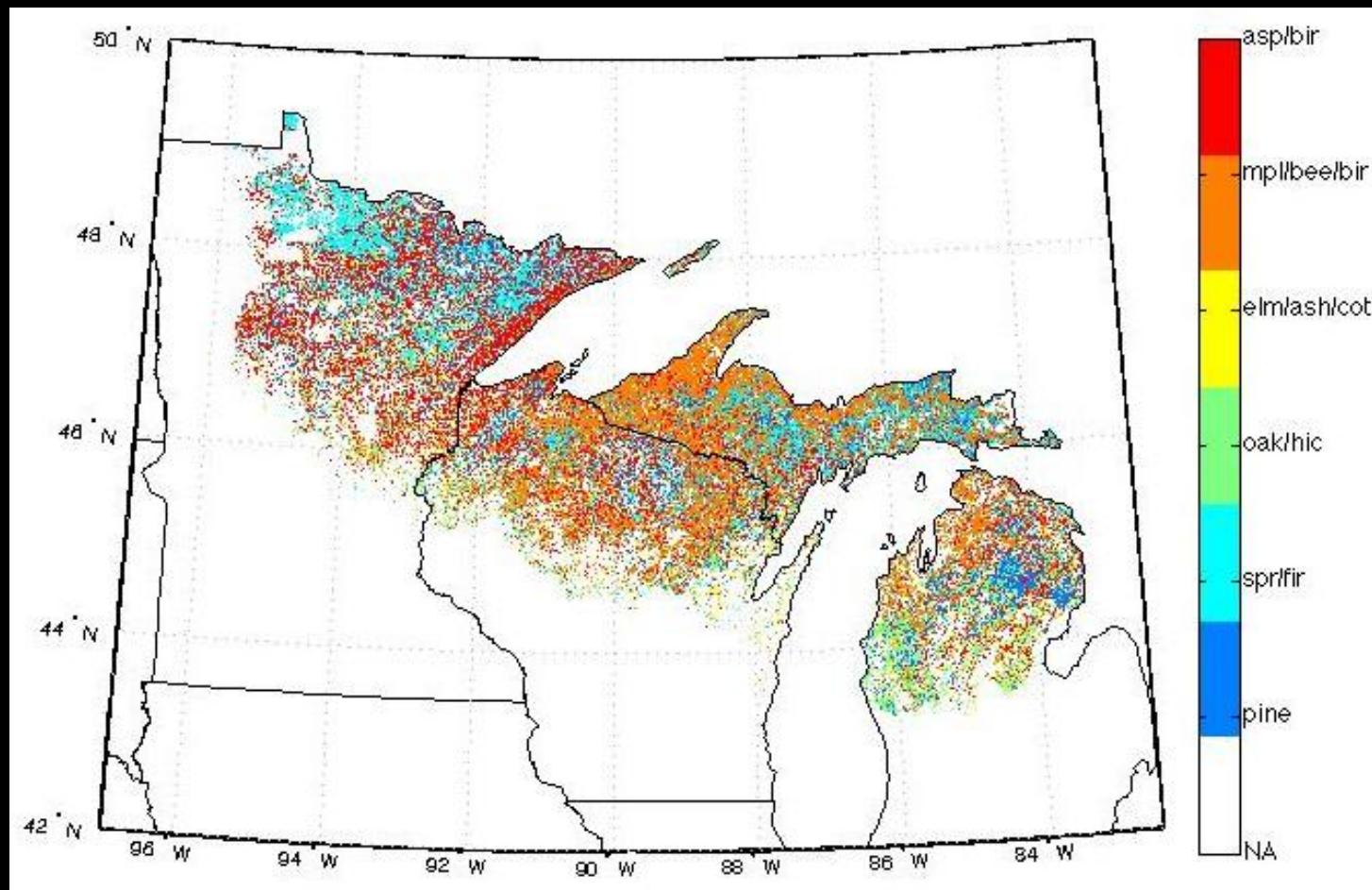
(a)

NPP (g/m<sup>2</sup>)

0 - 715	776 - 818	857 - 889	923 - 949	983 - 1031
716 - 775	819 - 856	890 - 922	950 - 982	1032 - 1665



# MN Climate Change Response Framework

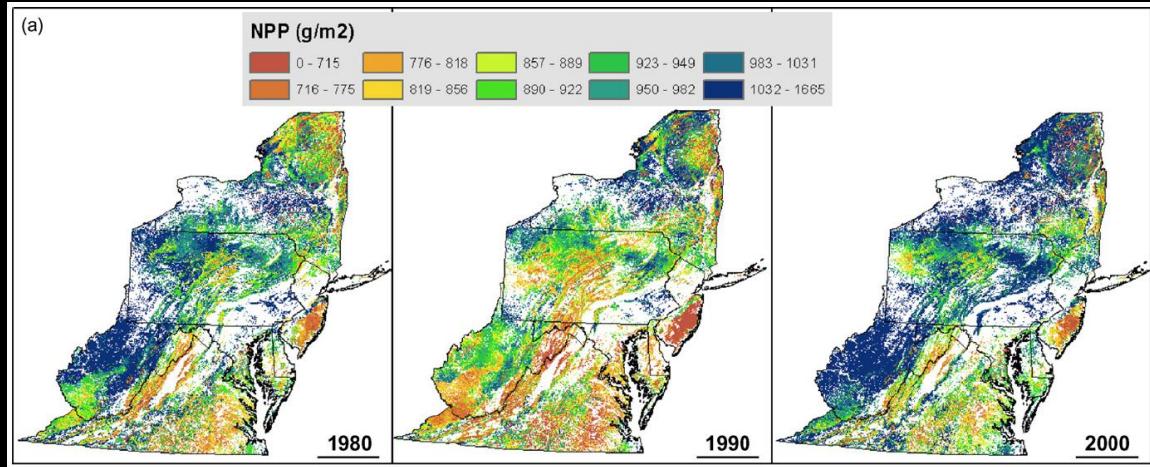


- Model simulations from 1960 to 2100
- 2 climate scenarios: high & low emissions
- 1 km resolution

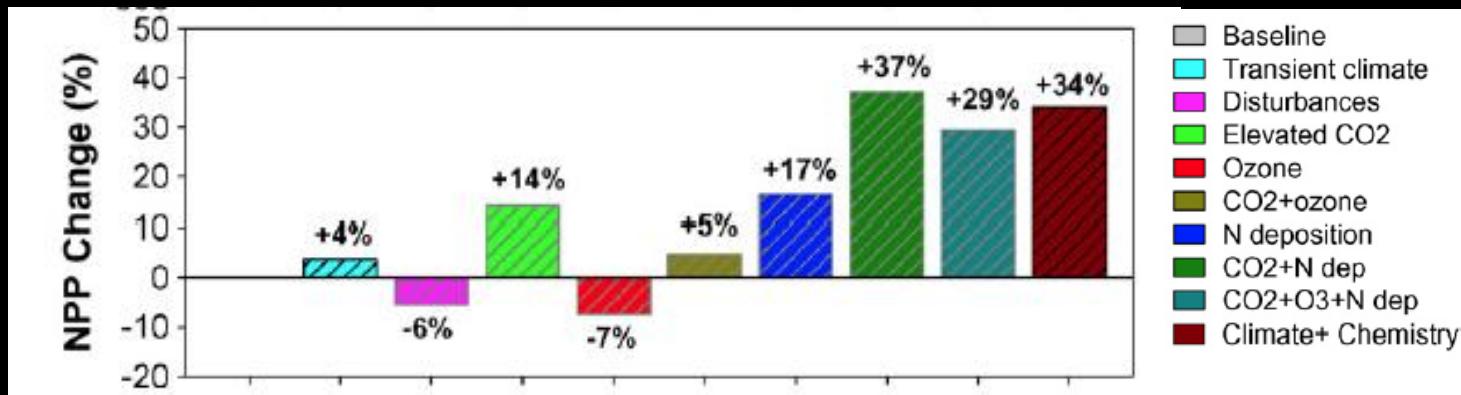
source: USFS 2007

# Expected Analyses

## 1. Maps of NPP and change in NPP for 2040, 2070, and 2100

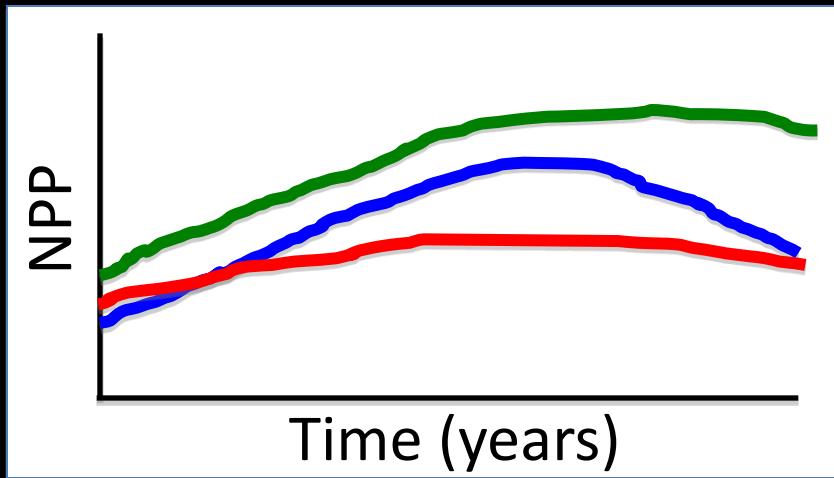


## 2. Compare relative influence of different global change factors on NPP (e.g. CO<sub>2</sub>, temperature, O<sub>3</sub>, N deposition)

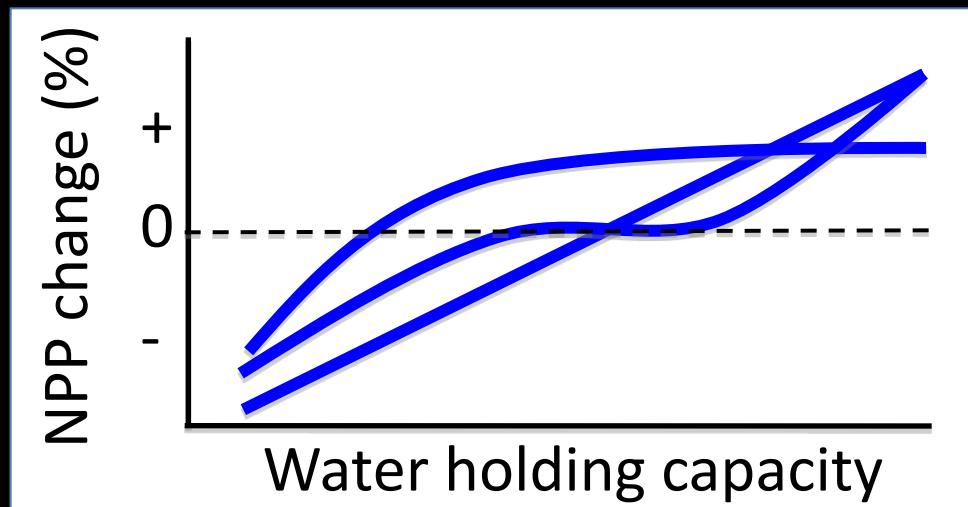


# Expected Analyses

3. What forest types do better/worse over time?



4. And where?



# Contact Information

**Emily Peters**  
Ecologist, Postdoc  
[ebpeters@umn.edu](mailto:ebpeters@umn.edu)  
612-626-2120

**Kirk Wythers**  
[kwythers@umn.edu](mailto:kwythers@umn.edu)  
612-625-2261

**Peter Reich**  
Lead P.I.

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